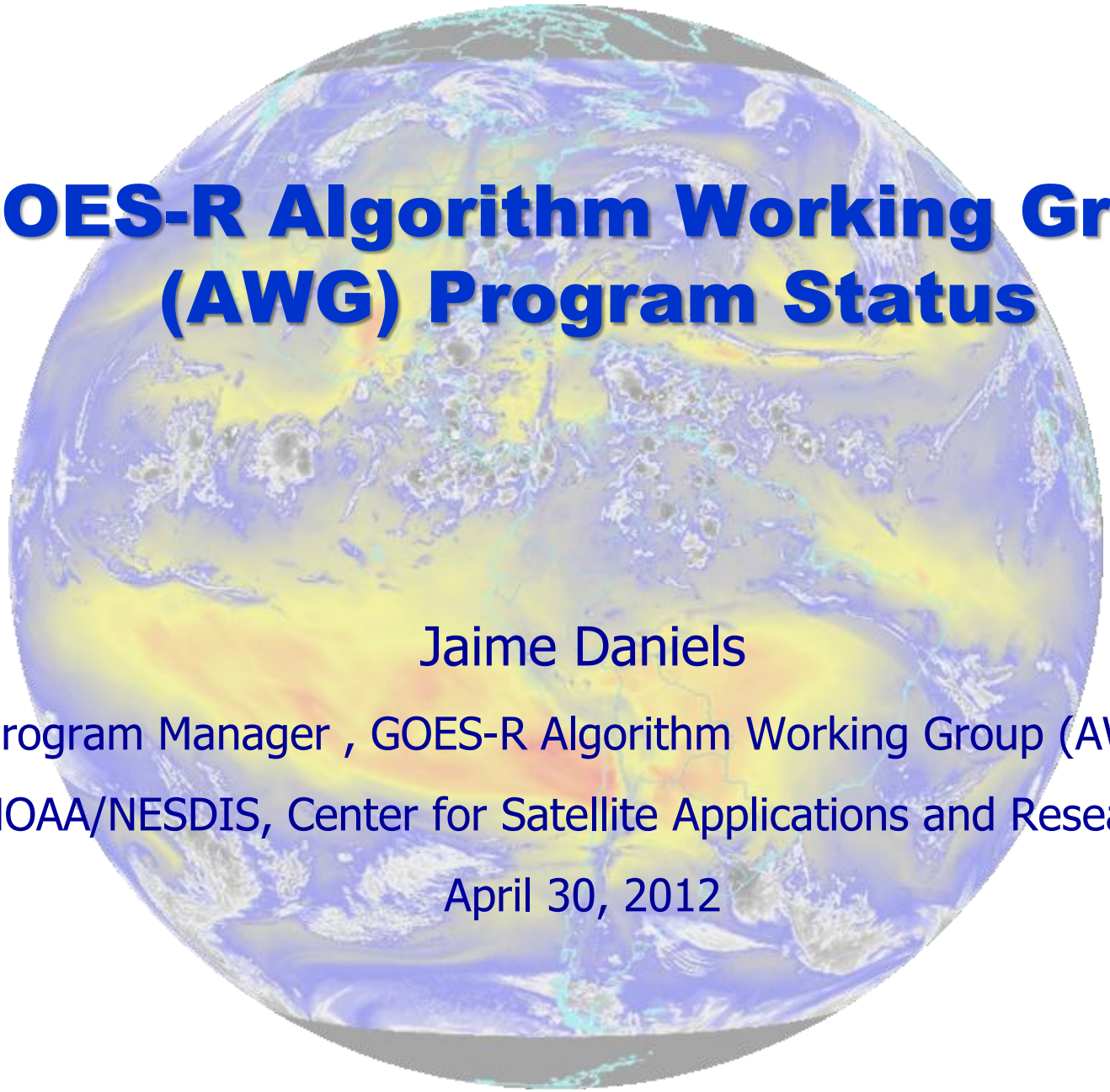


GOES-R Algorithm Working Group (AWG) Program Status

Jaime Daniels

Program Manager , GOES-R Algorithm Working Group (AWG)

NOAA/NESDIS, Center for Satellite Applications and Research

April 30, 2012

Thanks to: AWG Team Leads and all members of the GOES-R AWG teams

Outline

- **AWG Scope of Work**
- **Status of Deliverables to the GOES-R Program**
- **Status of AWG Activities**
  - Support to Harris/AER's Algorithm Implementation Activities
  - Product Development (Option-2)
  - Product Validation (Baseline)
  - Support for ABI waiver analyses
- **Looking Ahead**

AWG Scope of Work

- **Development of Level-2 product algorithms (Baseline & *Option-2)**
- **Support to Harris/AER's Algorithm Implementation Activities**
- **Development of Level-2 product validation tools *needed post-launch* for:**
  - Routine monitoring of L2 product performance *(accuracy, precision)*
  - "Deep-dive" assessments and analysis of products *(problem resolution)*
- **Continued validation and characterization of product performance**
  - Through *pre-launch* Level-2 product demonstrations and validation studies
  - Using available ABI proxy data and reference/"ground truth" measurements

* - *Now termed "Future Capabilities" Products*

GOES-R Products

Baseline Products

Advanced Baseline Imager (ABI)

- Aerosol Detection (Including Smoke and Dust)
- Aerosol Optical Depth (AOD)
- Clear Sky Masks
- Cloud and Moisture Imagery
- Cloud Optical Depth
- Cloud Particle Size Distribution
- Cloud Top Height
- Cloud Top Phase
- Cloud Top Pressure
- Cloud Top Temperature
- Derived Motion Winds
- Derived Stability Indices
- Downward Shortwave Radiation: Surface
- Fire/Hot Spot Characterization
- Hurricane Intensity Estimation
- Land Surface Temperature (Skin)
- Legacy Vertical Moisture Profile
- Legacy Vertical Temperature Profile
- Radiances
- Rainfall Rate/QPE
- Reflected Shortwave Radiation: TOA
- Sea Surface Temperature (Skin)
- Snow Cover
- Total Precipitable Water
- Volcanic Ash: Detection and Height

Geostationary Lightning Mapper (GLM)

- Lightning Detection: Events, Groups & Flashes

Space Environment In-Situ Suite (SEISS)

- Energetic Heavy Ions
- Magnetospheric Electrons & Protons: Low Energy
- Magnetospheric Electrons: Med & High Energy
- Magnetospheric Protons: Med & High Energy
- Solar and Galactic Protons

Magnetometer (MAG)

- Geomagnetic Field

Extreme Ultraviolet and X-ray Irradiance Suite (EXIS)

- Solar Flux: EUV
- Solar Flux: X-ray Irradiance

Solar Ultraviolet Imager (SUVI)

- Solar EUV Imagery

Future Capabilities

Advanced Baseline Imager (ABI)

- Absorbed Shortwave Radiation: Surface
- Aerosol Particle Size
- Aircraft Icing Threat
- Cloud Ice Water Path
- Cloud Layers/Heights
- Cloud Liquid Water
- Cloud Type
- Convective Initiation
- Currents
- Currents: Offshore
- Downward Longwave Radiation: Surface
- Enhanced “V”/Overshooting Top Detection
- Flood/Standing Water
- Ice Cover
- Low Cloud and Fog
- Ozone Total
- Probability of Rainfall
- Rainfall Potential
- Sea and Lake Ice: Age
- Sea and Lake Ice: Concentration
- Sea and Lake Ice: Motion
- Snow Depth (Over Plains)
- SO_2 Detection
- Surface Albedo
- Surface Emissivity
- Tropopause Folding Turbulence Prediction
- Upward Longwave Radiation: Surface
- Upward Longwave Radiation: TOA
- Vegetation Fraction: Green
- Vegetation Index
- Visibility

AWG Deliverables & Status

- **Algorithm Packages (APs)**
  - Algorithm Theoretical Basis Documents (ATBD)
  - Instrument proxy datasets
  - Product output datasets (for reproducibilty)
  - Algorithm Interfaces and Ancillary Data Description (AIADD) document
- **Schedule of Deliveries to the GOES-R Program**

✓ September 2008:	As-Is ATBDs
✓ September 2009:	80% APs for Baseline Products
✓ November 2010:	100% APs for Baseline Products 80% APs for Option 2 Products
✓ September 2011:	100% APs for Option 2 Products; 80% APs for Visibility, Rainfall Potential & Rainfall Probability
September 2012:	100% APs for Visibility, Rainfall Potential, and Rainfall Probability; Routine Validation Tool Documentation

Some ADEB Recommendations

From ADEB Final Report (Dec. 2, 2011)…

- Serious consideration needs to given *to making validation an ongoing activity*. In particular, consider separating development activity from validation and commit to *pursuing more complete data sets even after 100% delivery.* (In reference to baseline & future capability products)

- The board recommends a *special focus be given to the evaluation of future capability algorithms using a fused or integrated approach* to deliver the best science. Integration and / or fusion of these algorithms with respect to multi-observational approaches (e.g. other satellites, ground based radar, surface and airborne in-situ observations, etc.) as well as assimilation into numerical models, could produce far more effective results.

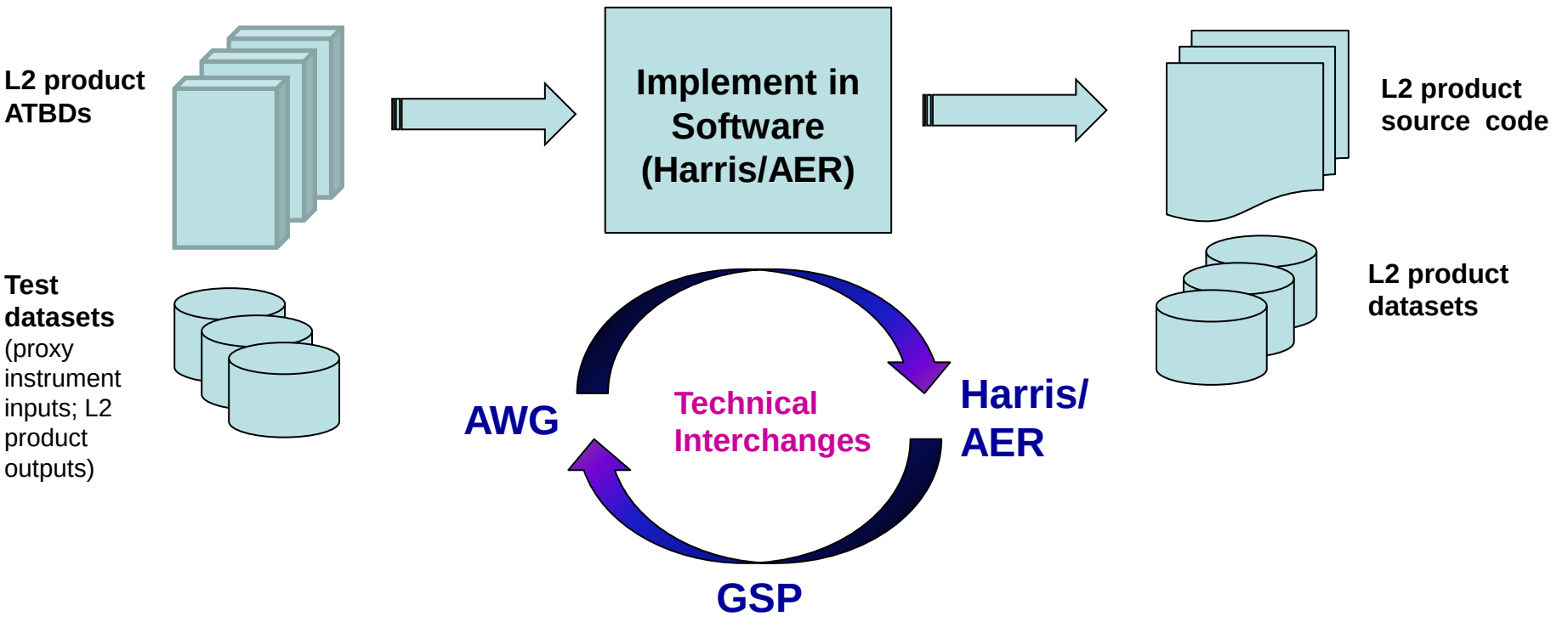
- Recommend teams *coordinate with users to revise requirements* ,where appropriate, *for any future capabilities development*.

- *Wherever feasible, implement these algorithm improvements in current operations*. This will allow for more rigorous operational testing and evaluation, as well as early realization of benefits from the GOES-R Program.

STATUS OF AWG ACTIVITIES

- **Support to Harris/AER's Algorithm Implementation Activities**
- Product Algorithm Development (Option-2)
- Product Validation (Baseline)
- Support for ABI waiver analyses

From ATBDs to Level-2 Product Software



- **AWG is currently working closely with Harris/AER and the GOES-R Ground Segment Project (GSP) to support the implementation of GOES-R Level-2 product algorithms into the ground segment**
  - Process is critical for proper implementation of the L2 product algorithms
  - Process is key for Harris to meet the reproducibility requirement (GSFPS-2758)

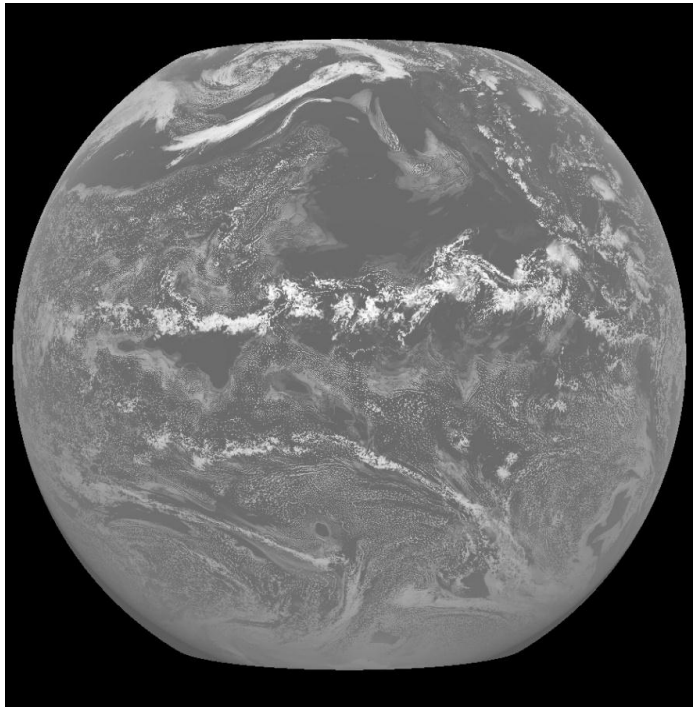
Getting to Reproducibility

Assuring Correct L2 Algorithm Implementation…

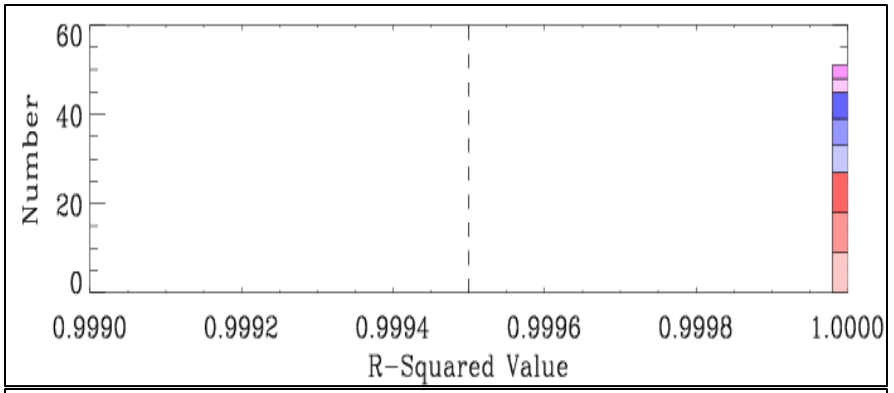
- **AER Activities**
  - Review of GFE GS-11 algorithm packages (ATBDs and test data sets)
  - Review AWG source code
  - Develop Algorithm Description Documents (ADD)
  - Develop algorithm software
  - Perform reproducibility testing (documented in technical notes)
- **Interactions between AWG Teams and Harris/AER**
  - Technical Interchange Meetings (TIMs)
  - Document exchanges. (Questions, Answers, Clarifications, Resolutions)
  - AWG prepares and delivers updated test datasets and source code, as necessary
  - Weekly meetings to discuss issues and track progress (GSP, AWG, Harris, AER)
  - Bring full understanding of AWG developed algorithms to Harris/AER
- **Commitment of all to the process**
- **Fruits of these efforts are beginning to show up**
  - In AER's reproducibility statistics for L2 products that have gone through their SWIT process

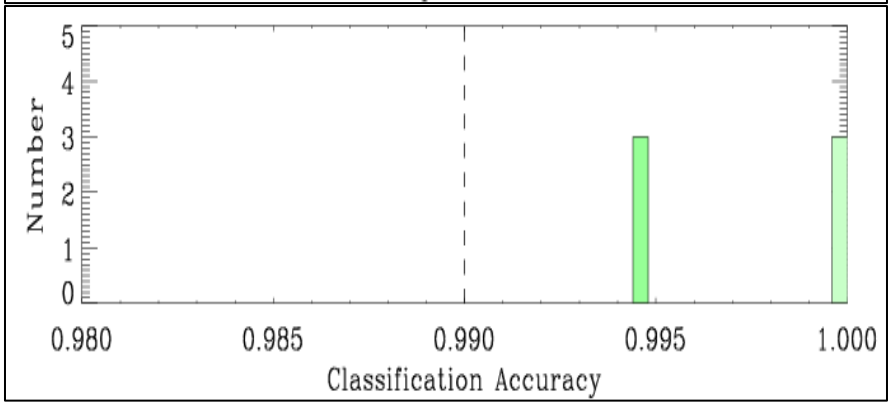
First Reproducibility Results

Imagery



Full Disk Output – 11 μm Brightness Temperature





- AWG provided responses to 26 questions asked by Harris/AER Team.
- Reproducibility Tests were performed on 53 test cases combining Full-disk, Conus and Mesoscale images.

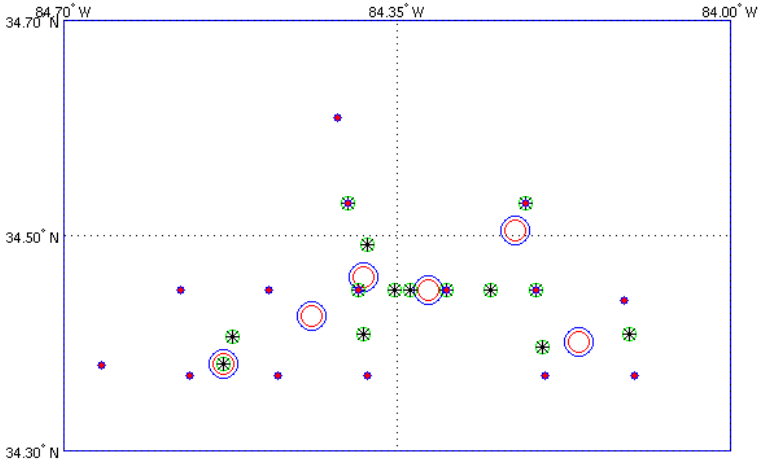
All output are exceeding reproducibility requirements!

Scene Type	Number of Unique Cases	Requirements Verification			
		Refl. Factor Native	Br. Temp. Native	Refl. Factor Aggr.	DQF Aggr.
FD	16	6	10	0	0
CONUS	19	6	9	0	0
MESO	18	6	9	SS: 3 AV: 3	SS: 3 AV: 3
Total	53	18	28	6	6

First Reproducibility Results

Lightning Cluster Filter Algorithm

'proxy-2006-07-29_large' dataset



- Blue open circle = AWG Flash
- Red open circle = AER Flash
- Green open circle = AWG Group
- Black star = AER Group
- Blue dot = AWG Event
- Red dot = AER Event

- AWG provided responses to 28 questions asked by AER/ Harris Team.
- Reproducibility Tests were performed on 112 test cases.
- An unlikely scenario was tested with 16745 Events, 3112 Groups and 815 Flashes over a 63 second time period.

Group and Flash Grouping Summary

Data Name	Number of Valid AWG Test Cases	Results Minimum Percentage
Groups	112	100.0
Flashes	112	99.705593

Group Properties Processing Summary

Data Name	Number of Valid AWG Test Cases	Results Minimum R-Squared
Group Latitude	110	0.999999999386
Group Longitude	110	0.999999998492
Group Footprint	110	0.999999999996
Group Energy	112	0.999999986666

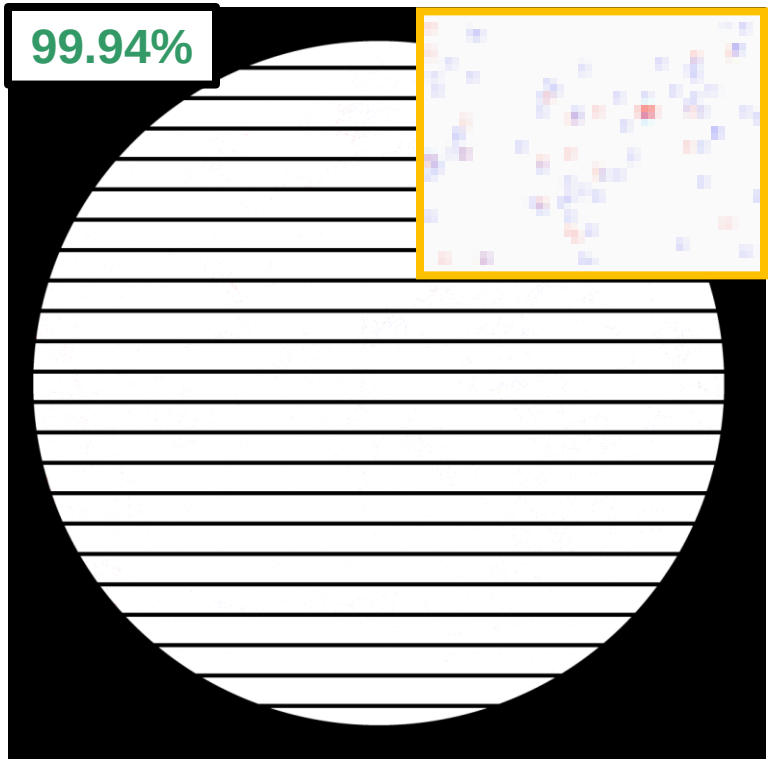
Flash Properties Processing Summary

Data Name	Number of Valid AWG Test Cases	Results Minimum R-Squared
Flash Time	109	1.000000000000
Flash Latitude	110	0.999999999940
Flash Longitude	110	0.999999997887
Flash Footprint	110	1.000000000000
Flash Energy	111	0.999999999992

All output is exceeds the >0.9995 R-squared reproducibility requirement!

First Reproducibility Results

Cloud Mask



SEVIRI_2007056_1700 – AER/AWG Cloud Mask Differences

Output	Accy
Binary Cloud Mask	99.92%
Data Quality Flag	100%
4-Level Cloud Mask	99.72%

- AWG provided responses to 121 questions asked by Harris/AER Team.
- Reproducibility Tests were performed on 36 full-disk SEVIRI scenes with a total of 7.8 million pixels compared.
- Comparison of all the cloud mask tests were also examined to ensure that the tests were completed accurately.

Binary Cloud Detection Test Results

DIF Bit	Accy
RTCT	100.00%
ETROP	99.99%
PFMFT	99.99%
NFMFT	100.00%

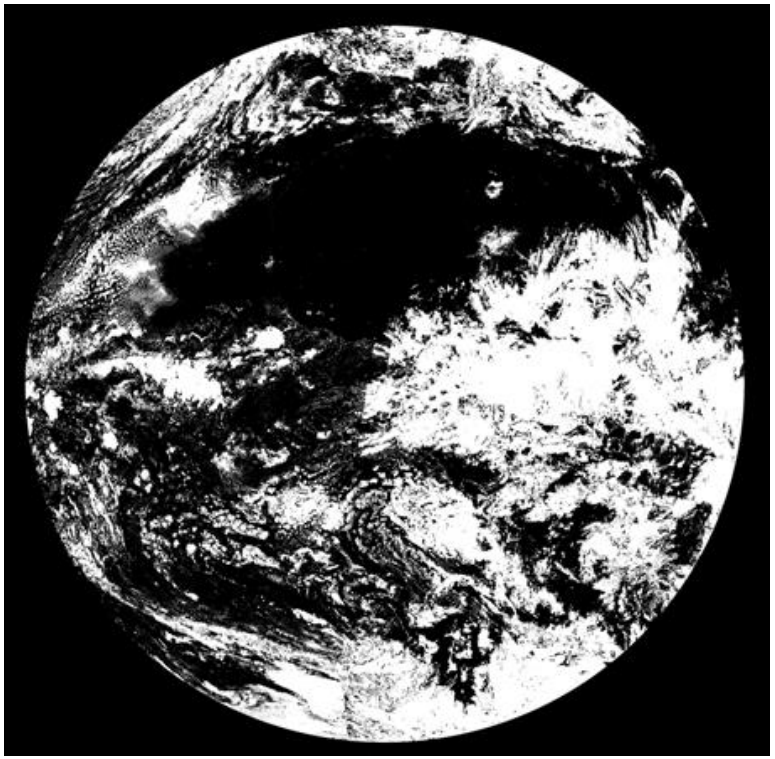
Uniformity & Restoral Test Results

DIF Bit	Accy
RUT	99.99%
TUT	99.85%
CSRT	99.99%
PCRT	99.75%

All output is > 99% classification accuracy reproducibility requirement!

First Reproducibility Results

Cloud Top Temperature, Pressure and Height



SEVIRI_2007057_0700_00 - Cloud Top Temperature

- AWG provided responses to 52 questions asked by Harris/AER Team.
- Reproducibility Tests were performed on 36 full-disk SEVIRI scenes with a total of 13.8 million pixels compared.
- The data quality flags met the >99% classification accuracy with a range of 99.996% - 99.999%.

Product	R-Squared min	R-Squared max	Outlier %min	Outlier %max
Temperature	0.99998447	0.99999992	0.0026%	0.0053%
Pressure	0.99999452	0.99999986	0.0029%	0.0109%
Height	0.99998988	0.99999993	0.0033%	0.0057%

All output is > 0.9995 reproducibility requirement, and < 1% outlier requirement!

STATUS OF AWG ACTIVITIES

- Support to Harris/AER's Algorithm Implementation Activities
- **Product Algorithm Development (Option-2)**
- Product Validation (Baseline)
- Support for ABI waiver analyses

Completing Development of

Option-2 Product Algorithms…

- Hydrology and Aviation Teams have developed, tested, and delivered Versions 4 of their remaining Option-2 product algorithm software to the AIT for integration into framework
  - ***Rainfall potential, rainfall probability, visibility***
- Preparing for their Code Unit Test Reviews
- Preparing for their Algorithm Readiness Reviews
- Working to complete their 100% Algorithm Theoretical Basis Documents (ATBD)
- ***Delivery to GOES-R Program (Sept 30, 2012)***

STATUS OF AWG ACTIVITIES

- Support to Harris/AER's Algorithm Implementation Activities
- Product Algorithm Development (Option-2)
- **Product Validation (Baseline)**
- Support for ABI waiver analyses

Product Validation Activities

Baseline Products…

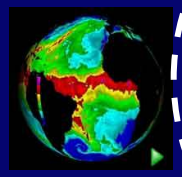
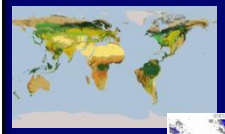
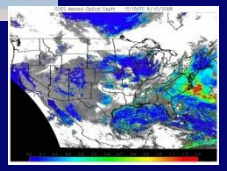
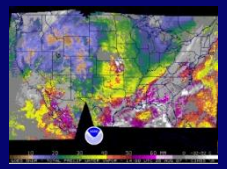
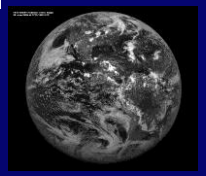
- Teams continue to develop and refine their ***routine and "deep-dive" validation tools***; documenting their routine validation tools
- Teams continue to further enhance their validation datasets to achieve ***"more complete validation"*** of baseline products
- Some teams have established routine near real-time product processing, when possible, using available proxy data
  - Identification of case study situations where algorithms perform well or struggle
  - Algorithm enhancements (beyond the 100% delivered algorithm)

More details of these activities will be in AWG oral and/or poster presentations

Assessing and Characterizing Algorithm Performance





Seasonal conditions represented

Wide variety of atmospheric and surface conditions are represented

Algorithm Iterations

Level 2 Product Generation

Validate with Ground Truth

As algorithms mature…

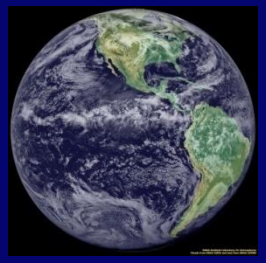
- ✓ Better estimates of product performance
- ✓ Increased confidence that on-orbit product performance will meet specs
- ✓ Increased confidence that user needs are met

AWG continues to assess and characterize the performance of the baseline algorithms during this pre-launch phase of the GOES-R Program.

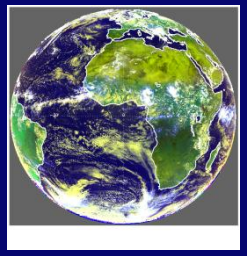
GOES-R Proxy Data Sources

"Real" PROXY Data Sources

Current GOES

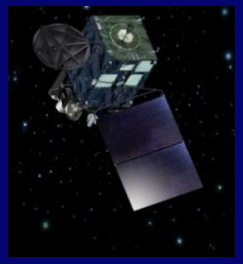


Meteosat/
SEVIRI

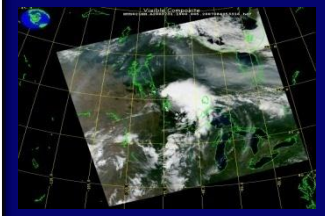


Future

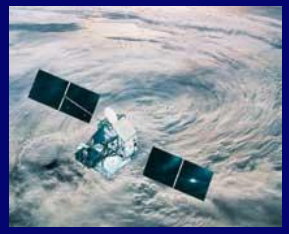
Himawari-8



MODIS

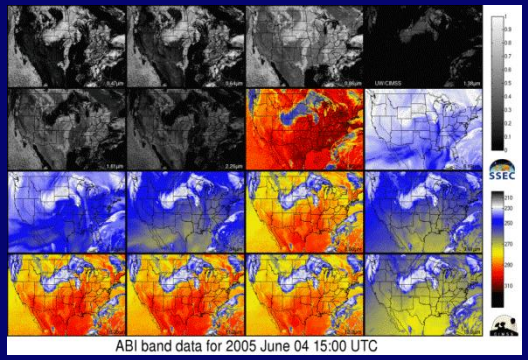


TRMM/LIS



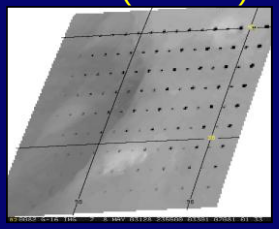
"Simulated" Proxy Data Sources

(FD, CONUS, Meso)

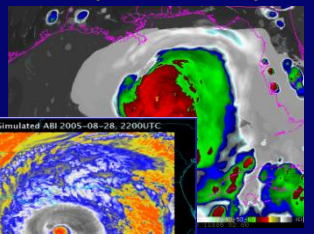


Case Studies

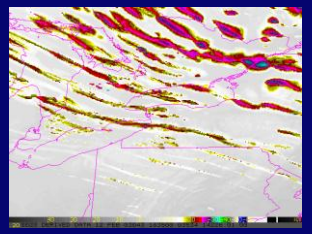
3.9um (for fires)

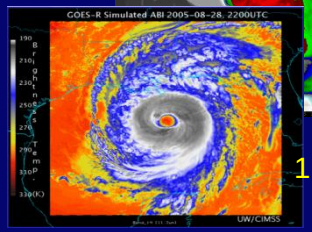


10.35um (Hurricane Lili)



10.35um (Lake Effect Snow)



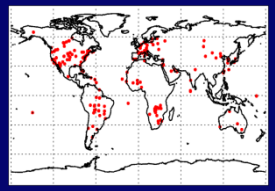


11.2 um (HurricaneKatrina)

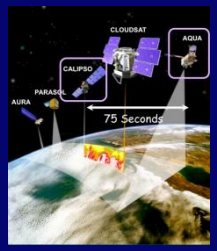
The AWG teams continue to use available proxy data for their algorithm refinement, case study analyses, and product validation efforts…

Reference/"Ground Truth" Data Sources

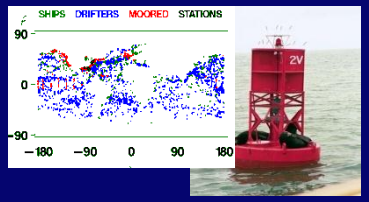
Aeronet Stations
Aerosol Optical Depth



CALIPSO, CLOUDSAT
Clouds, Icing



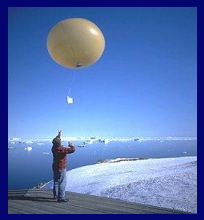
Bouys, Ships
SST



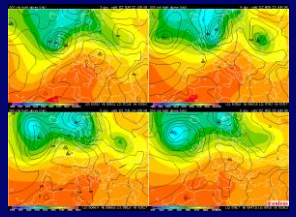
SURFRAD, ARM
LST, Radiation

Radiosondes

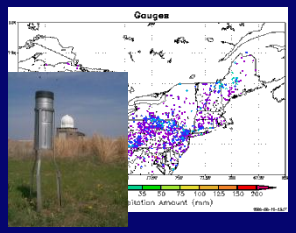
Winds,Temperature, Moisture, Stability



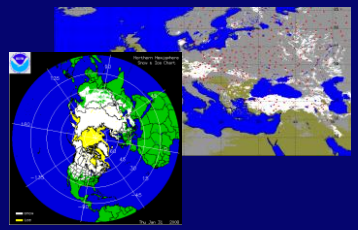
NWP Analyses
Winds, Temperature, Moisture



Rain Guages
Precipitation



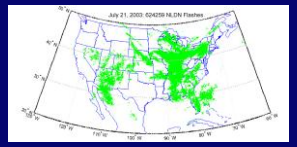
Sfc Snow Reports, NESDIS IMS
Snow



Ground-based Ozone
Ozone

Pilot Reports
Icing,Turbulence

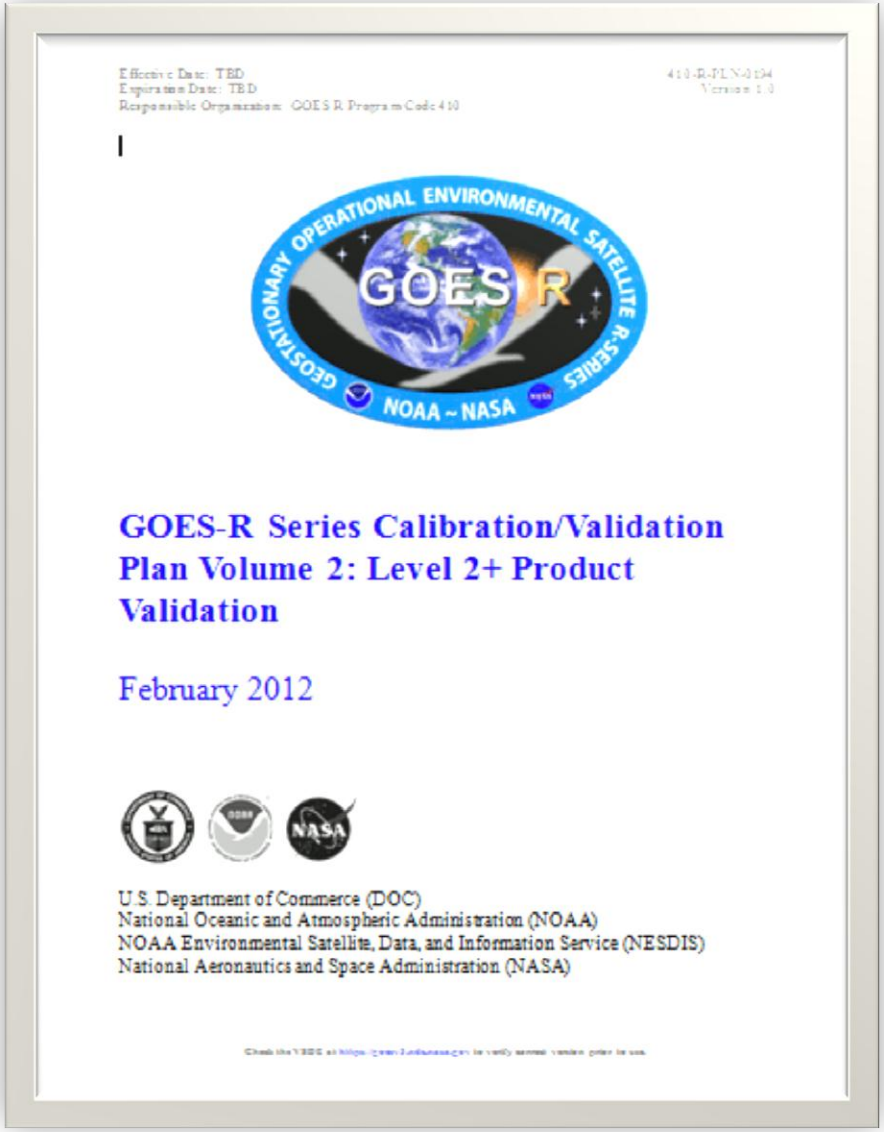
National Lightning Detection Network (NLDN)
Lightning



AWG Teams use a wide variety of Reference/"Ground Truth" datasets to assess and estimate Level-2 product algorithm performance.

GOES-R Series Cal/Val Plan Volume 2: Level-2 Product Validation

- **Successfully drafted**
- **Companion document to the GOES-R Series Cal/Val Plan Volume 1: Level 1b Data document**
- **Describes the post-launch Level-2 product validation processes and activities for each baseline product**
- **Been through GOES-R Program internal review process; to be put placed under CM control**



Effective Date: TBD
Expiration Date: TBD
Responsible Organization: GOES-R Program Code 410

GOES-R Series Calibration/Validation Plan Volume 2: Level 2+ Product Validation

February 2012

U.S. Department of Commerce (DOC)
National Oceanic and Atmospheric Administration (NOAA)
NOAA Environmental Satellite, Data, and Information Service (NESDIS)
National Aeronautics and Space Administration (NASA)

Thanks to AWG team leads, Bob Iacovazzi (GOES-R PSE), and Jeff Campbell (AWG)

AWG Posters

- **Product Algorithms**
  - Atmospheric Motion Vectors Derived via a New Nested Tracking Algorithm Developed for the GOES-R Advanced Baseline Imager (ABI) – Daniels, Bresky, Wanzong, Bailey, Velden
  - Imagery from the Advanced Baseline Imager (ABI) on GOES-R series - Schmit, Bah, Gunshor, Rink, Otkin, Feltz, Schreiner
  - Improving GOES-R Precipitation Products Associated with Deep Convective Systems by using NEXRAD Radar Network over the Continental U.S. - Dong, Li, Kuligowski
  - Future enhancements to GOES-R retrievals of nighttime cloud optical and microphysical properties - Heck, Minnis, Hong, Chang, Bedka, Yost, Ayers
  - Daytime Cloud Optical and Microphysical Parameters (DCOMP) for GOES-ABI and VIIRS – Walther, Heidinger
  - The Snow Cover product for GOES-R Advanced Baseline Imager - Rost, Eicher, Painter

AWG Posters

- **Product Algorithms *(cont'd)***
  - SST from GOES-R and JPSS: Algorithms, Products, Cal/Val and Monitoring - Ignatov, Petrenko, Dah, Liang, Stroup
  - The GOES-R Tropopause Folding Turbulence Product: Finding clear-air turbulence in GOES water vapor imagery – Wimmers, Feltz
  - The GOES Objective Overshooting Top and Enhanced-V Signature Detection Products: Algorithm Description, Validation, and Application - *Bedka, Brunner, Dworak, Feltz, Fleeger*
  - GOES-R Ocean Dynamics Algorithm - *Maturi*
  - Sea and Lake Ice Thickness and Age with GOES-R ABI and NPP/JPSS VIIRS - *Wang, Key, Liu*
  - Ice Cover and Concentration with GOES-R ABI and NPP/JPSS VIIRS - *Liu, Key, Wang*
  - The GOES-R Probability of Rainfall Algorithm – *Kuligowski, Barnhill, Zhang*
  - The GOES-R Rainfall Potential Algorithm – *Kuligowski, Zhang*
  - GOES-R ABI Snow Depth Algorithm and Product: Development and Performance Assessment – *Romanov*

AWG Posters

- **<u>Validation</u> - Product Performance, Tools**
  - Intercomparison of Lightning Location Systems during CHUVA-GLM field campaign and thunderstorm characteristics - *Albrecht, Morales, Goodman, Blakeslee, Bailey, Carey, Mach, Hall, Bateman, Rudlosky, Holler, Betz, Mattos, Nag, Said, Lojou, Heckman, Pinto Jr., Naccarato, Saraiva, Saba, Holzworth, Anderson, Collins*
  - GOES-R AWG GLM Val Tool Development - *Bateman, Mach, Goodman, Blakeslee, Koshak*
  - Atmospheric Motion Vectors Derived via a New Nested Tracking Algorithm Developed for the GOES-R Advanced Baseline Imager (ABI) – *Daniels, Bresky, Wanzong, Bailey, Velden*
  - SST from GOES-R and JPSS: Algorithms, Products, Cal/Val and Monitoring - *Ignatov, Petrenko, Dah, Liang, Stroup*
  - Land Surface Temperature Production and Validation Tool development for GOES-R Mission - *Yu, Wang, Tarpley, Hale*

AWG Posters

- **<u>Validation</u> - Product Performance, Tools *(Cont'd)***
  - GOES-R ABI Aerosol Product Validation and Tools - An Update - *Zhou, Ciren, Laszlo, Liu, Kondragunta*
  - An integrated validation system for GOES-R products leveraging collocated JPSS and A-Train Observations - *Holz, Quinn, Nagle, Kuehn*
  - GOES-R ABI Deep-Dive Active Fire Product Validation - *Schroeder, Schmidt, Hoffman, Csiszar*
  - GOES-R ABI Snow Depth Algorithm and Product: Development and Performance Assessment – *Romanov*
  - Validation and maintenance of ABI Shortwave Radiation Budget Algorithm - *Liu, Laszlo, Kim*
  - Results and tools developed for evaluation and monitoring of GOES-R/ABI absorbed shortwave radiation at surface product - *Kim, Laszlo, Liu*
  - The GOES Objective Overshooting Top and Enhanced-V Signature Detection Products: Algorithm Description, Validation, and Application - *Bedka, Brunner, Dworak, Feltz, Fleeger*
  - Validation of GOES-R ABI Flood and Standing Water Algorithm - *Zhang, Sun, Yu*

AWG Proxy Team Activities

- **Radiative Transfer Modeling (RTM)**
  - Working to improve CRTM performance for IR radiance simulation for GOES-R applications ***(recent focus on LAP T/Q products)***
  - JCSDA has created a alpha upgrade to the CRTM that ***runs 15 times faster*** than the version used during AWG algorithm development
  - Version has been tested by the AWG and the sounding products have been reproduced with significant reductions in run time

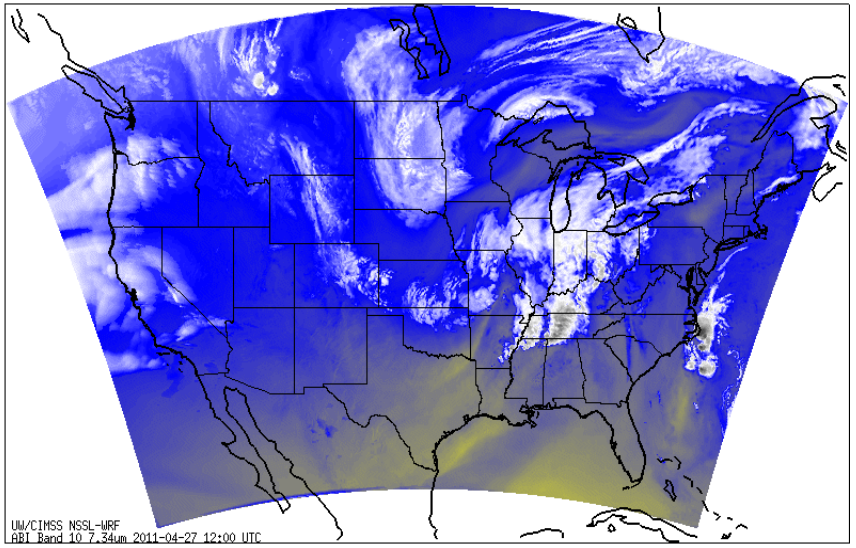
- **Generation of GOES-R Proxy Data**
  - **GLM** *(Steve Goodman will talk more about this Tuesday; posters)*
    - AWG team at National Space Science & Technology Center, Huntsville, Al
  - **ABI** *(Tim Schmit will talk more about this Tuesday; posters)*
    - AWG team members at CIMSS & CIRA

Simulated ABI Data

From the AWP Proxy Team at CIMSS…

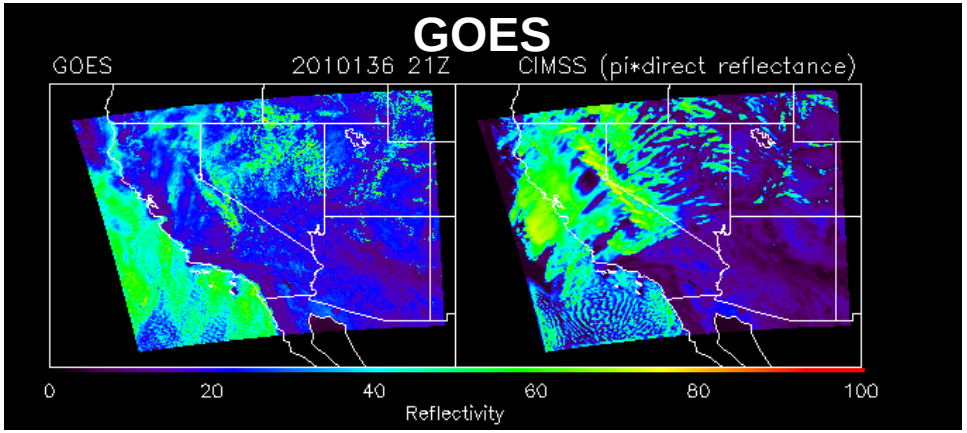
- Continue to generate near-real-time data (ABI bands 2, 8-16) *for Proving Ground & AWG* using the 4-km NSSL WRF model output
- Produced a special simulated ABI dataset using NSSL WRF data to test atmospheric motion vector algorithms **(See Poster #10, Thurs.)**
- Plans are to use WCRTM, which we developed to interface WRF data with the CRTM, in future production of these data **(See Poster #10, Thurs.)**
- WRF-CHEM Aerosol and Ozone proxy data activities focused on evaluation of uncertainties in the simulated ABI 0.64um data using the CRTM
  - CRTM uncertainties focused on representation of land surface emissivity/reflectivity

Simulated 7.34 um band



Observed
(0.64um reflectance)

Simulated
(TOA 0.64um reflectance)

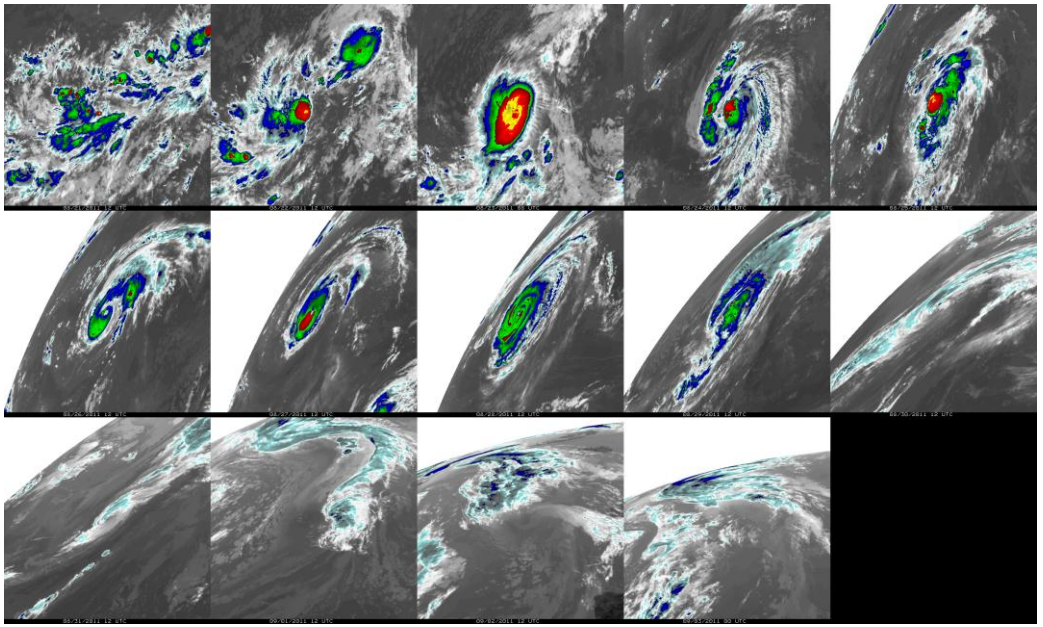


Proxy ABI Data

From the AWP Proxy Team at CIRA…

- **Simulated GOES-R tropical cyclone proxy datasets were produced for five 2010 tropical cyclones**
  - using MSG channels 4-11
  - Simulating ABI channels 7-16
  - Temporal resolution: 15 minutes
- **Datasets and documentation delivered to AWG proxy team**

SEVIRI channel 9 imagery (10.8 μm) collected over Hurricane Danielle



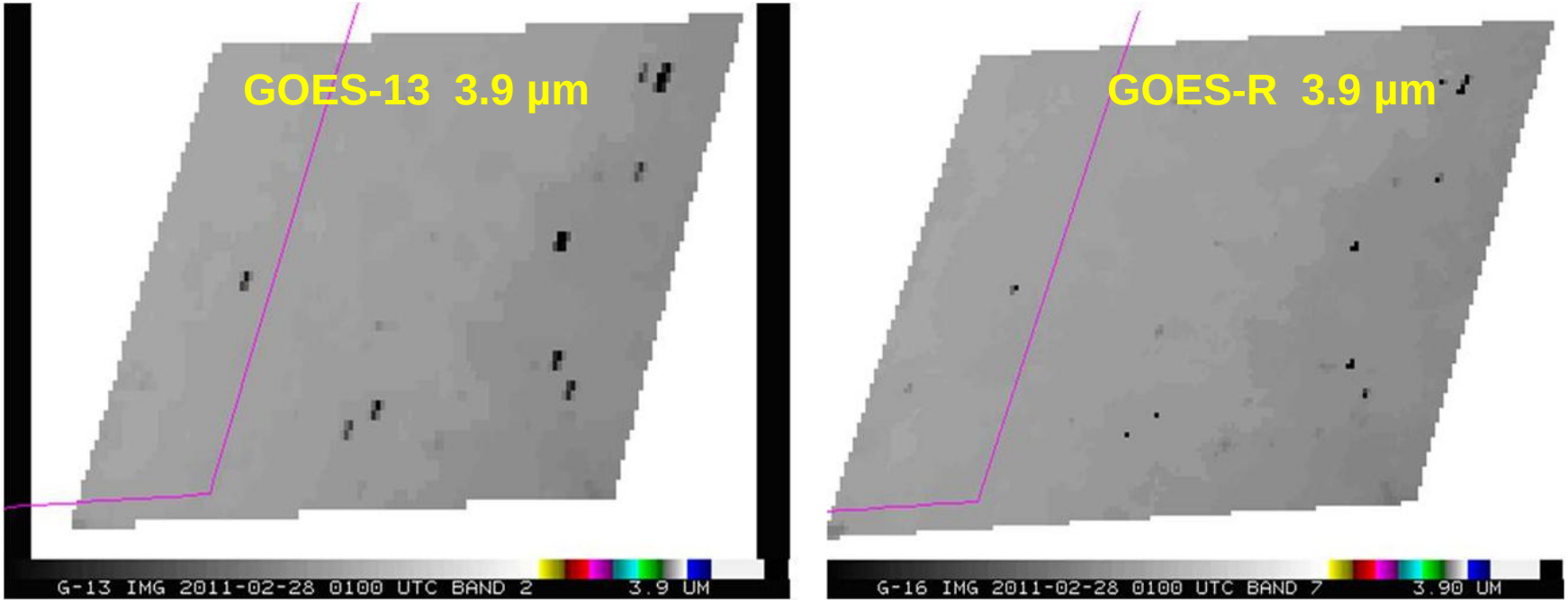
Tropical Cyclones	*Number of MSG/SABI Images*
Danielle (August 2010)	1143
Igor (September 2010)	1395
Julia (September 2010)	1163
Lisa (September 2010)	823
Otto (October 2010)	1049

ABI Proxy Data *(Fires)*

From the AWP Proxy Team at CIRA…

Production of GOES-R ABI fire proxy datasets:

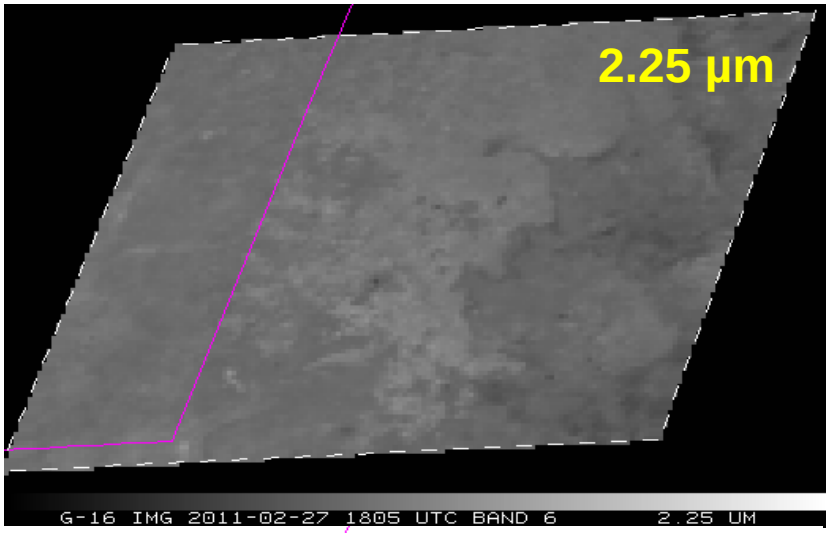
- Fast moving Texas Panhandle wildfire (February 2011)
- Fire proxy datasets cover 12 hour time periods (starting at 27 Feb 18 UTC)
- Brightness temperatures for ABI bands: 2.25, 3.9, 10.35, and 11.2 μm
- Resolution: ABI foot print / every 5 minutes (total of 144 frames per band).

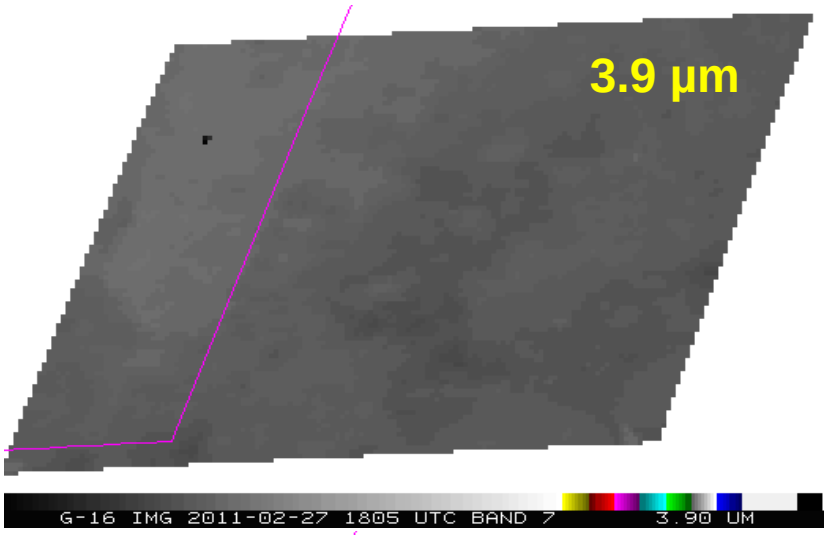


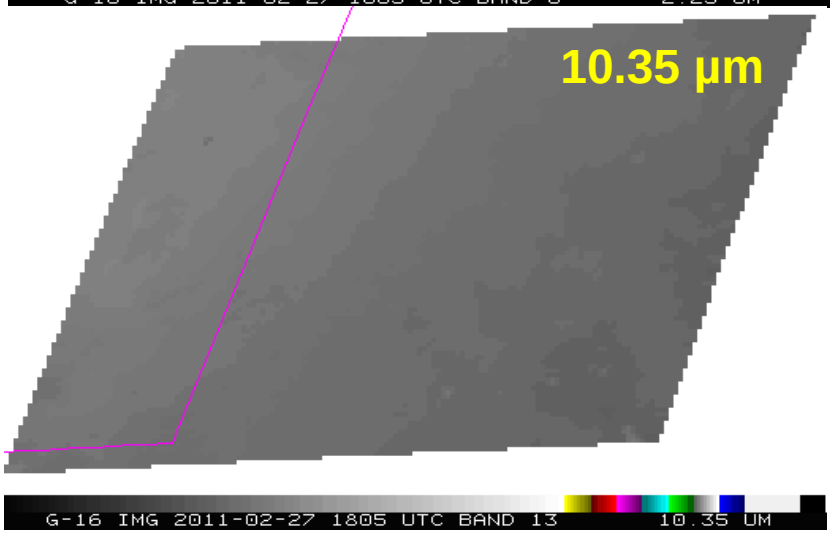
Texas fire proxy data 2011-02-28 at 0100 UTC
Comparison of GOES-13 3.9 μm (left) and GOES-R ABI 3.9 μm (right).

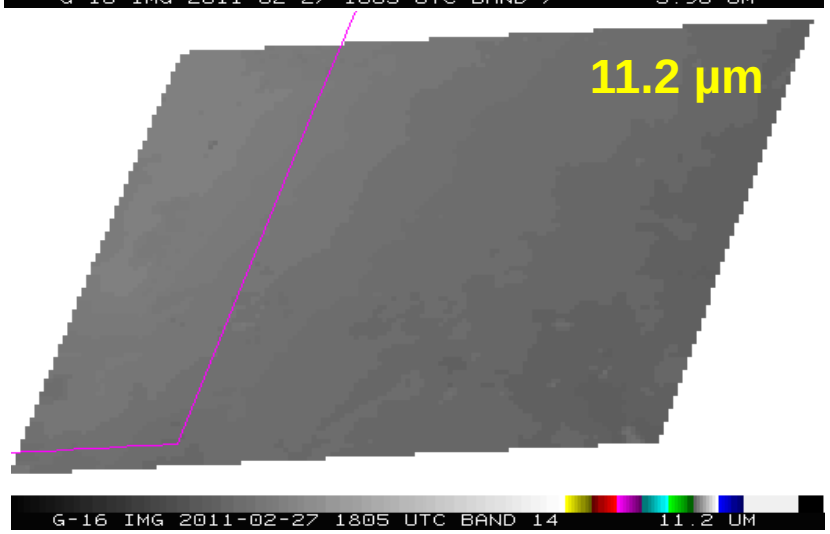
ABI Proxy Data *(Fires)*

From the AWP Proxy Team at CIRA…









***Fast moving Texas fire case**: 2011-02-27 at 2115 UTC (mid afternoon local time):*

AWG Algorithm Integration Team Progress

- Preparing for Code Unit Test (CUT) reviews of remaining Option-2 product algorithms
- Preparing for integration of remaining Option-2 product algorithm latest software updates into framework
- Algorithm bug fixes in Framework resulting in the need to update and re-deliver some of the baseline product test datasets
- Correct problems/bugs with product software and/or test datasets uncovered as a result of interchanges with Harris/AER
- Re-generation and redelivery of baseline product test data sets, as needed
- Continue to coordinate all AWG team responses to AER questions with GSP and Harris/AER *(> 1000 questions answered)*
- Preparing for generation of baseline products over extended time periods.

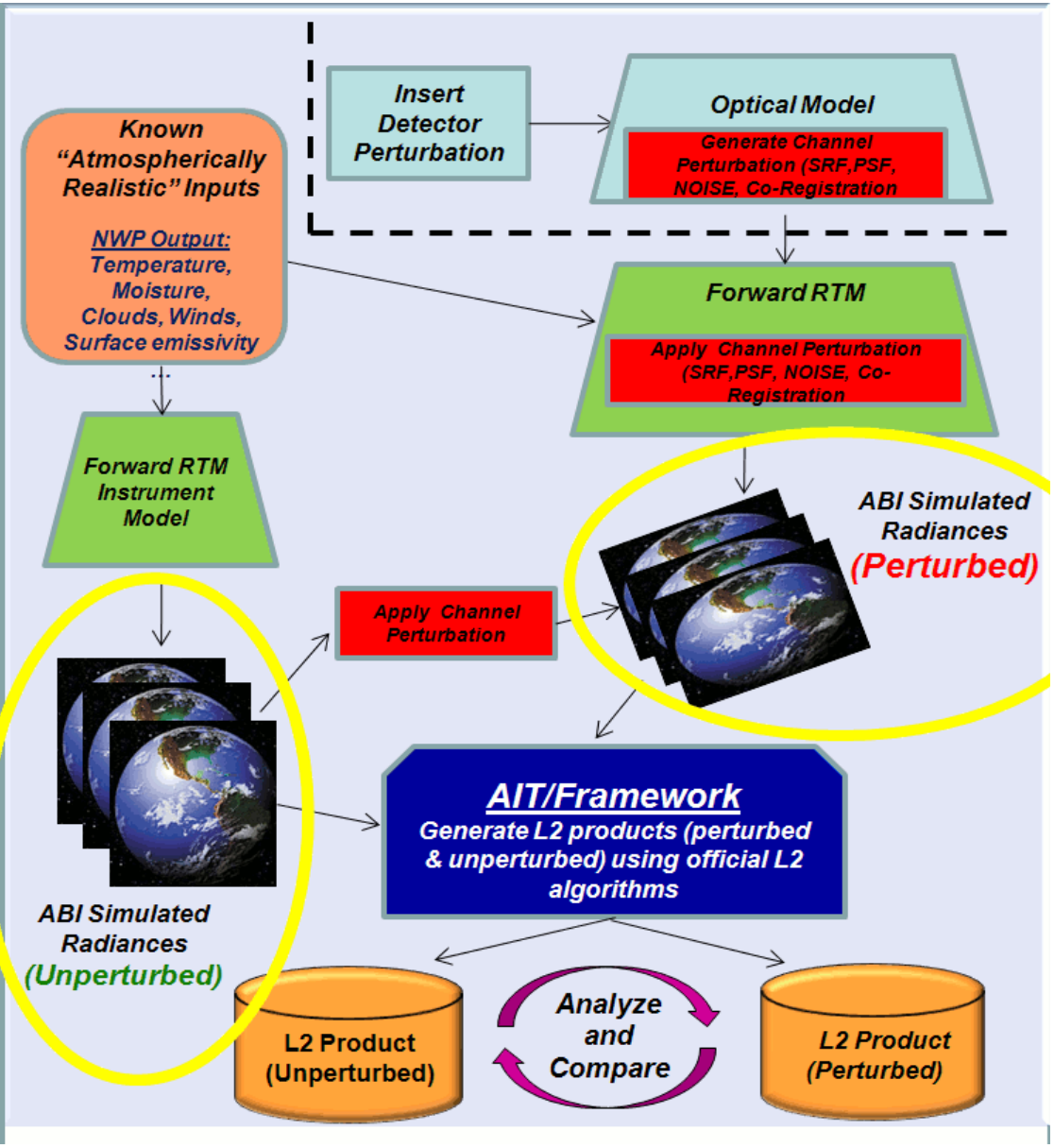
STATUS OF AWG ACTIVITIES

- Support to Harris/AER's Algorithm Implementation Activities
- Product Algorithm Development (Option-2)
- Product Validation (Baseline)
- **Support for ABI waiver analyses**

AWG Capabilities in Support of an End-to-End Instrument Waiver Analysis Process

GOES-R Analysis Facility for Instrument Impacts on Requirements (GRAFIIR)

- Collection of capabilities/tools that support the GOES-R Program's "Photons to Products Modeling Capabilities"
  - NWP modeling
  - Radiative Transfer Model
  - Instrument perturbation tools
  - AWG L2 product algorithms
  - GLANCE Tool: Statistical comparison tool to analyze and quantify impact of perturbations



GLANCE Tool

Example output...

msg land surface temperature Variable Comparison

report produced with glance, version 0.2.6.25
comparison generated Thu Mar 31 18:28:07 2011 by user graemem on craackly.ssec.wisc.edu

file A:

path: /data/graemem/sounding_verification_20110331/data/geocatL2.Meteosat-8.2006230.000000_033011.hdf
md5sum for file A: 1f8c873343313b2d3533935c6b1249b4
last modified: Thu Mar 31 13:41:53 2011

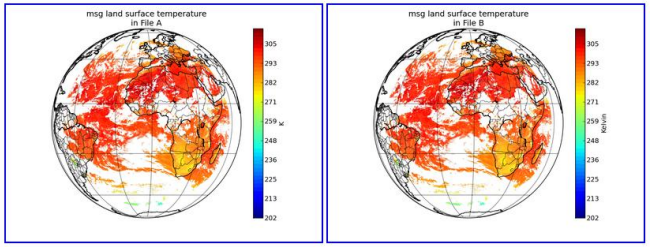
file B:

path: /data/graemem/sounding_verification_20110331/data/MSG8_SEVIRI_2006230_0000_00_AWG_SOUNDINGS_032411.nc
md5sum for file B: 47bb489e2c08cb5510eb57c0bbf80f7c
last modified: Thu Mar 31 13:44:39 2011

A configuration file was used to control the production report.
Please see this copy of the configuration file for details.

latitude in A: imager_prof_retr_msg_Lat_reduced
latitude in B: Latitude
longitude in A: imager_prof_retr_msg_Lon_reduced
longitude in B: Longitude
longitude/latitude comparison epsilon: 0.0001

Original Data



Comparison Information

variable name in A: imager_prof_retr_msg_Lst
variable name in B: LST
epsilon value: None
"missing" data value in A: -999.0
"missing" data value in B: -999.0
units in A: K
units in B: Kelvin

Statistical Summary

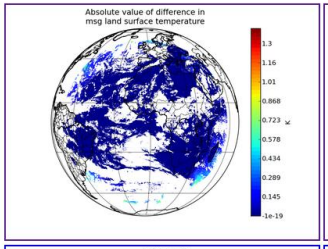
Finite Data Statistics
- a_finite_count*: 572249
- a_finite_fraction*: 0.3734
- b_finite_count*: 572249
- b_finite_fraction*: 0.3734
- common_finite_count*: 572249
- common_finite_fraction*: 0.3734
- finite_in_only_one_count*: 0
- finite_in_only_one_fraction*: 0

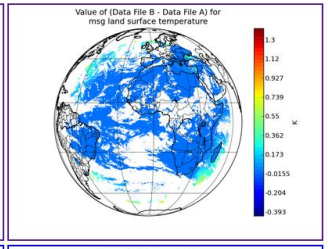
General Statistics
- a_missing_value*: -999
- b_missing_value*: -999
- epsilon*: None
- epsilon_percent*: None
- max_a*: 313.8
- max_b*: 314
- min_a*: 201.8
- min_b*: 201.8
- num_data_points*: 1532644
- shape*: (1238, 1238)
- spatially_invalid_pts_ignored_in_a*: 390328
- spatially_invalid_pts_ignored_in_b*: 390328

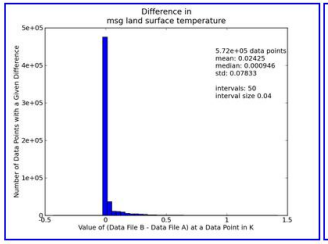
Missing Value Statistics
- a_missing_count*: 570067
- a_missing_fraction*: 0.372
- b_missing_count*: 570067
- b_missing_fraction*: 0.372
- common_missing_count*: 570067
- common_missing_fraction*: 0.372

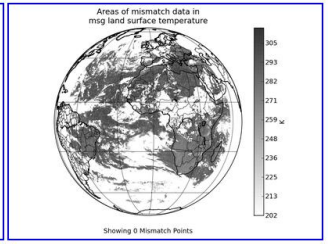
NaN Statistics
- a_nan_count*: 0
- a_nan_fraction*: 0
- b_nan_count*: 0
- b_nan_fraction*: 0
- common_nan_count*: 0
- common_nan_fraction*: 0

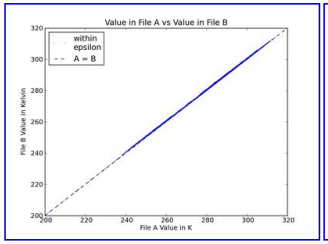
Numerical Comparison Statistics
- correlation*: 0.9999
- diff_outside_epsilon_count*: 0
- diff_outside_epsilon_fraction*: 0
- max_diff*: 1.417
- mean_diff*: 0.02425
- median_diff*: 0.000946
- mismatch_points_count*: 0
- mismatch_points_fraction*: 0
- perfect_match_count*: 5784
- perfect_match_fraction*: 0.01011
- r-squared correlation*: 0.9998
- rms_diff*: 0.08197
- std_diff*: 0.07833

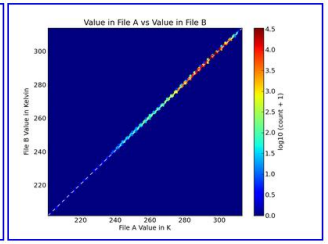












Looking Ahead

- Near-term AWG deliverables
  - 100% Option-2 L2 Algorithm Packages for Visibility, Rainfall Potential, and Rainfall Probability (9/30/2012)
  - Routine L2 product routine validation tool documentation (9/30/2012)
- Continue to support the baseline Level-2 product algorithm implementation activity being done by the Harris/AER team
- Continue to support the GOES-R Program for end-to-end GOES-R ABI waiver analyses

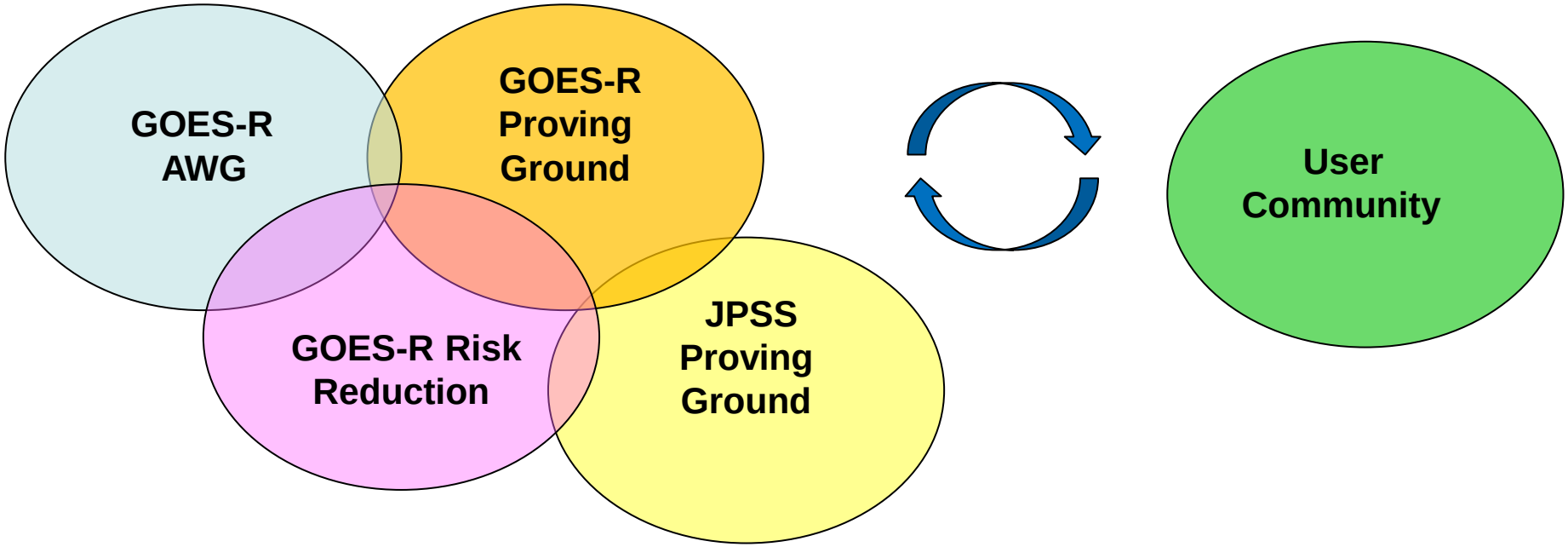
Looking Ahead

- **Continue Level-2 Product Validation Activities**
  - Continue validation tool development & documentation
  - Continue pursuit of more complete validation datasets
  - Generate/Demonstrate products from available proxy/simulated data
    - *Exercise the AWG product processing framework*
    - *Routine near real-time processing (outlier studies and analysis)*
    - *Manual processing (case studies)*
    - *Validate and improve error characterization of products*
  - Working on the development of new GOES-R AWG web page to improve the visibility of AWG validation activity outcomes & capabilities

- **Continue Baseline Level-2 Product Algorithm Enhancements (beyond 100% algorithm delivery)**
  - Outcome of continuing product validation activities
  - Demonstrate and document algorithm enhancements
  - Carefully manage and document algorithm deltas

Looking Ahead

- **Future Capabilities Product Algorithms**
  - Presents an opportunity to further improve a number of the algorithms and/or their application to meet existing and evolving user needs.
  - Coordinated activities between the GOES-R Program Office, AWG, GOES-R3, GOES-R Proving Ground, JCSDA, JPSS, and users will be critical for meeting these evolving needs



Supporting User Readiness is a responsibility of all!

Looking Ahead

- **STAR and OSPO in this for the long haul**
  - Will be the recipients of the entire GOES-R System
  - STAR/AWG will provide science support immediately after launch and on a continuous basis during the years after launch
    - Support anomaly resolution
    - Perform L2 product algorithm updates
    - Development of new algorithms and application and support the transition of these into operational environment
  - OSPO will maintain system and provide user services on a continuous basis during the years after launch

BACKUPS

AWG Teams

AWG Product Application Teams	Team Lead
Imagery	Tim Schmit
Soundings	Tim Schmit
Winds	Jaime Daniels
Clouds	Andrew Heidinger
Aviation	Ken Pryor, Wayne Feltz
Hydrology	Robert Kuligowski
Land	Bob Yu
Cryosphere	Jeff Key
Radiation Budget	Istvan Lazslo
Lightning	Steve Goodman
SST	Alexander Ignatov
Ocean Dynamics	Eileen Maturi
Aerosols/Air Quality/Atmos. Chemistry	Shobha Kondragunta

AWG Specialty Teams	Team Lead
Proxy Data	Fuzhong Weng
Cal/Val (Sensor)	Changyong Cao
Algorithm Integration	Walter Wolf

AWG Cal/Val Tool Development

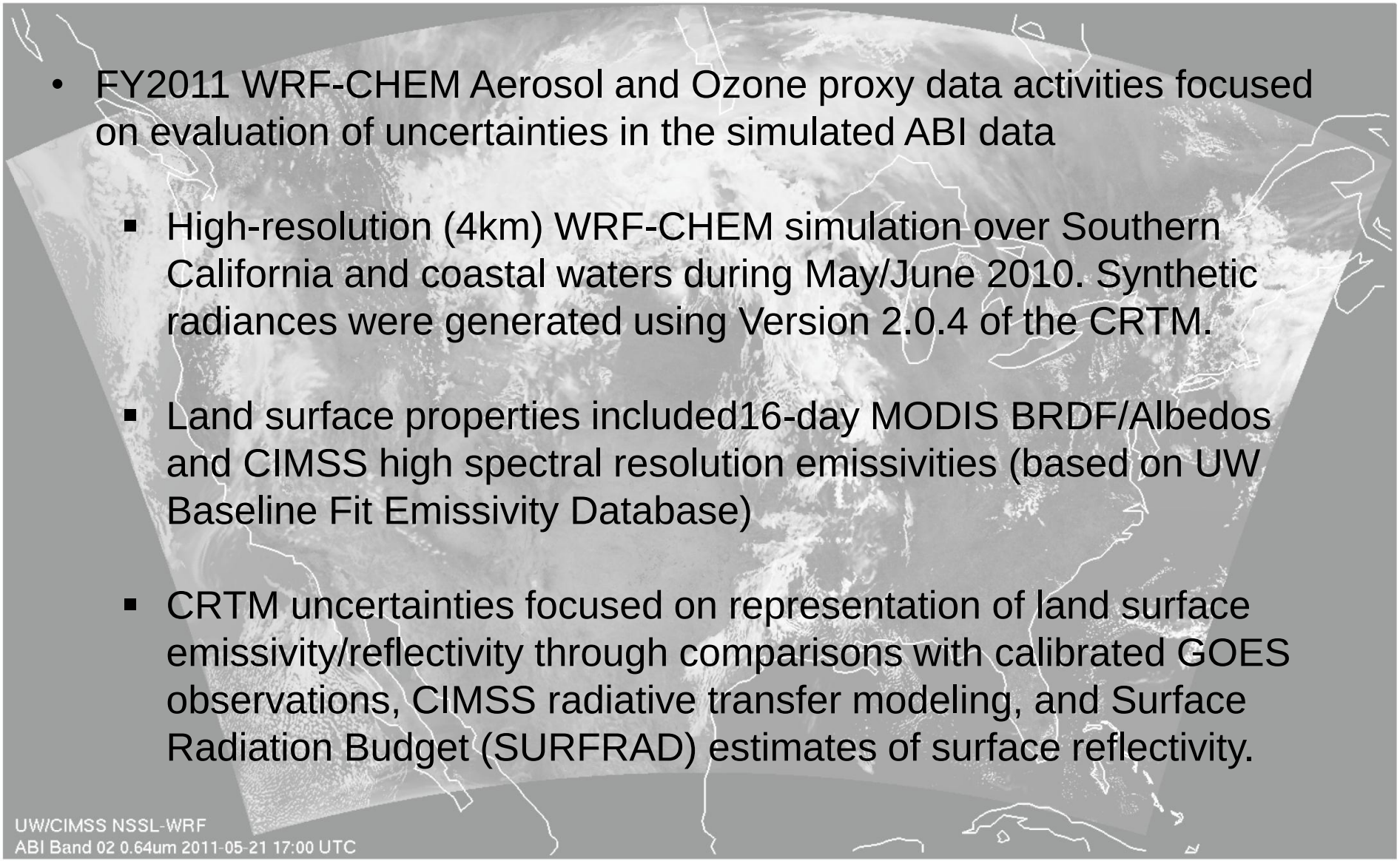
Two Categories of Validation Tools…

- **"Routine" Calibration/Validation Tools**
- **"Deep-dive" Calibration/Validation Tools**

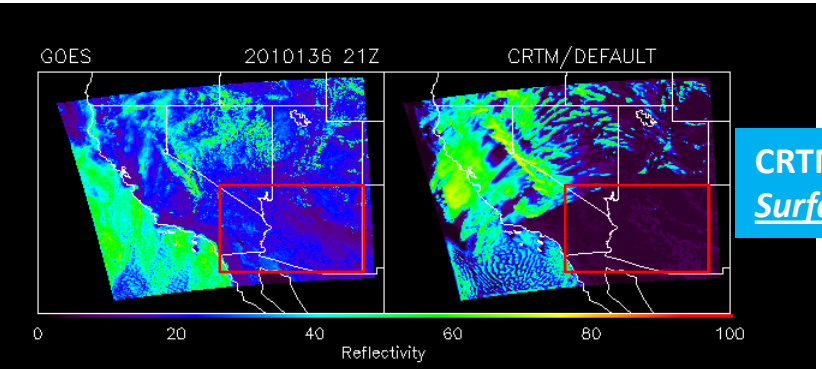
	"Routine" Validation Tools	**"Deep Dive"** Validation Tools
	Bulk/overview analysis	Detailed/point analysis
	Executed soon after product generation	Not executed in real-time. May need to wait for other datasets
	Run routinely	Run when more detailed analysis of product performance is needed
	Run within OSPO and STAR	Run within STAR
	Automated	Automated and/or Interactive components

Simulated ABI Data at CIMSS

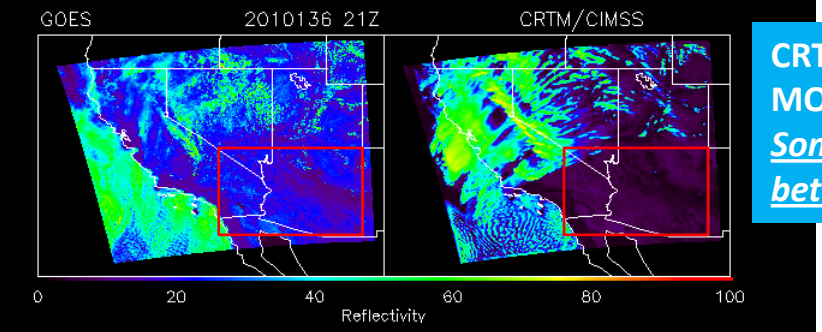
- FY2011 WRF-CHEM Aerosol and Ozone proxy data activities focused on evaluation of uncertainties in the simulated ABI data
  - High-resolution (4km) WRF-CHEM simulation over Southern California and coastal waters during May/June 2010. Synthetic radiances were generated using Version 2.0.4 of the CRTM.
  - Land surface properties included16-day MODIS BRDF/Albedos and CIMSS high spectral resolution emissivities (based on UW Baseline Fit Emissivity Database)
  - CRTM uncertainties focused on representation of land surface emissivity/reflectivity through comparisons with calibrated GOES observations, CIMSS radiative transfer modeling, and Surface Radiation Budget (SURFRAD) estimates of surface reflectivity.



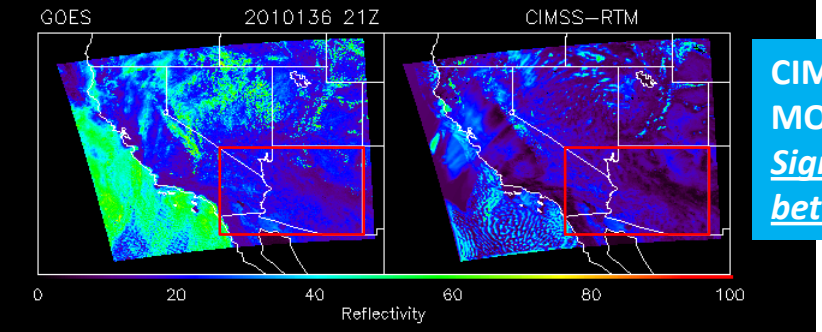
CRTM Surface reflectivity testing: CalNex 4km Proxy



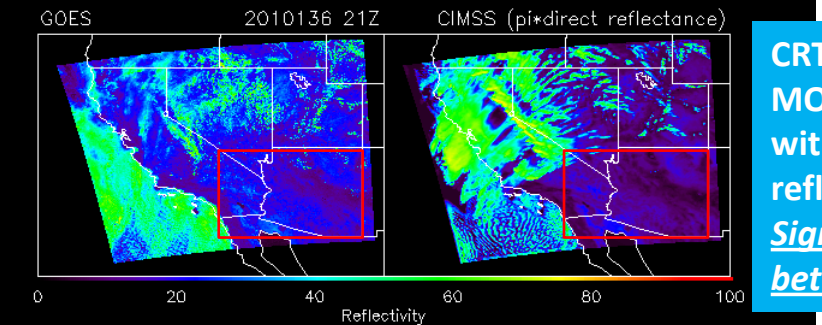
CRTM Default: ***Surface too dark***



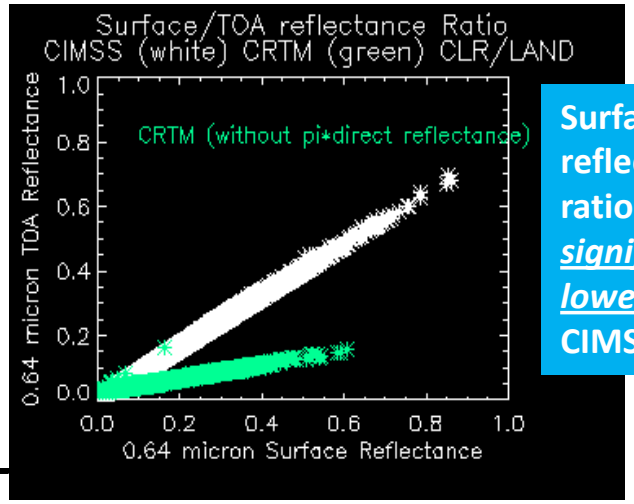
CRTM/ MODIS BRDF: ***Somewhat better***



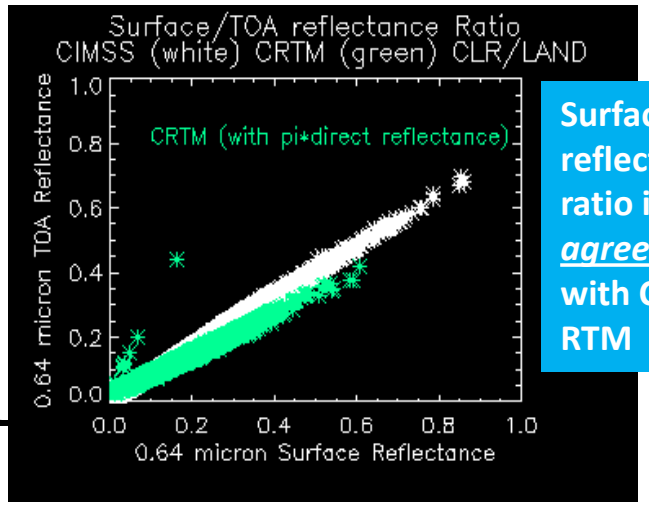
CIMSS-RTM/ MODIS BRDF: ***Significantly better***



CRTM/ MODIS BRDF with pi*direct reflectance: ***Significantly better***



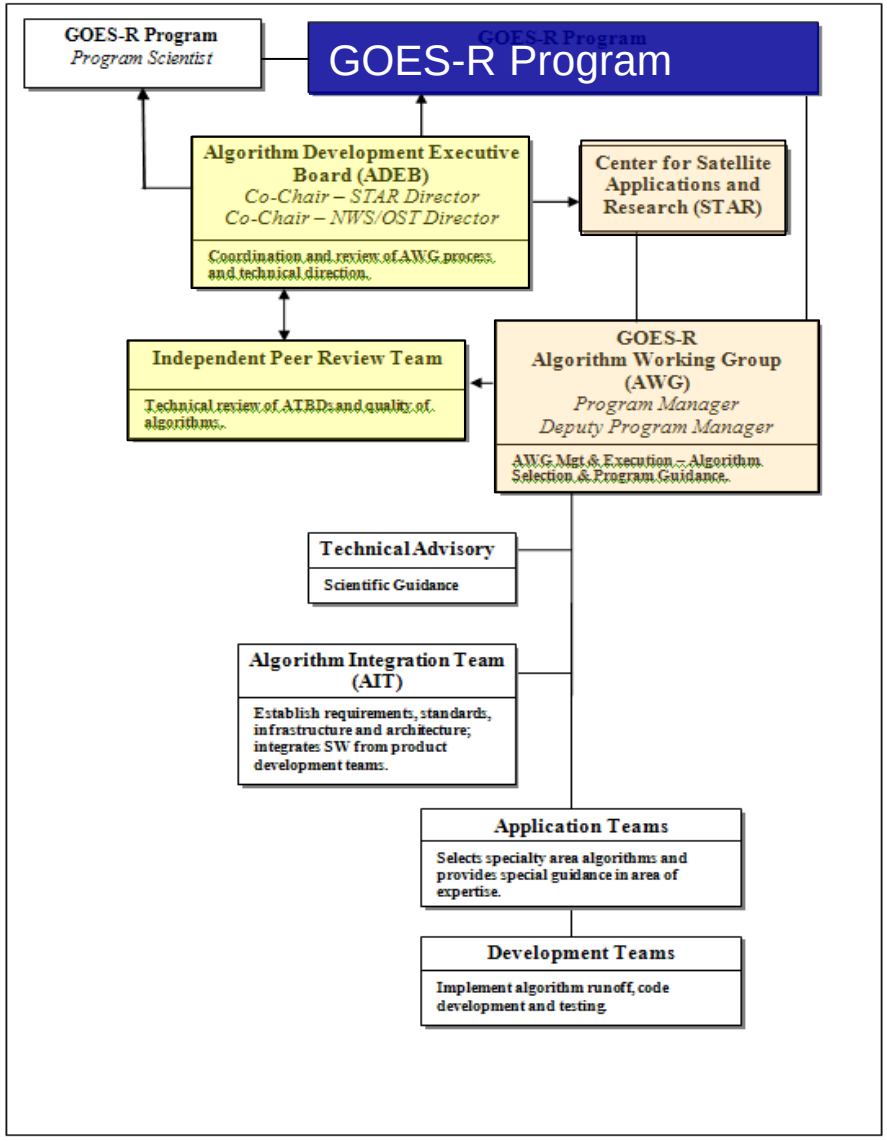
Surface/TOA reflectance ratio ***significantly lower*** **than CIMSS-RTM**



Surface/TOA reflectance ratio in ***good agreement*** **with CIMSS-RTM**

Comparison between GOES, CRTM, and CIMSS-RTM TOA 0.64 mm reflectances during CalNex has revealed a potential scaling issue in the CRTM V2.0.4 direct reflectance that results in significant reductions in clear sky TOA reflectances over land. A CRTM ticket request (#316) has been submitted to address this issue.

Algorithm Development Executive Board (ADEB)

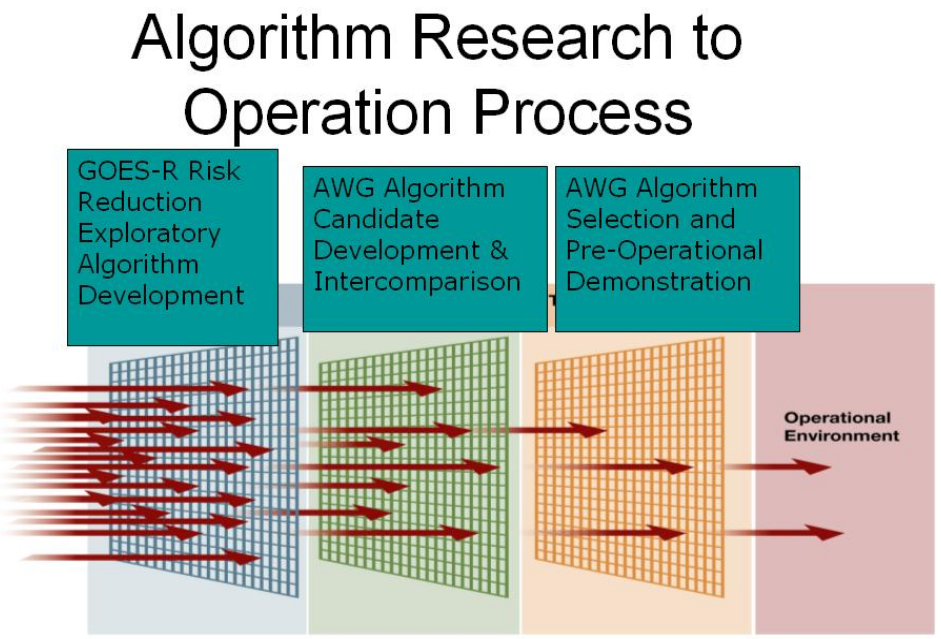


- **Primary Objectives**
  - Provide an independent assessment ***of processes*** followed by the AWG in the course of their algorithm development activities
  - Provide a thorough, independent ***technical assessment*** of the GOES-R AWG Level-2 algorithms
  - Report findings back to the GOES-R Program
- **ADEB Membership**
  - Representatives from stakeholder organizations (NWS, DoD, University, private industry)
  - Supported by a team of Independent Peer Reviewers (IPR)
    - Subject matter experts not involved with or funded by GOES-R

GOES-R Algorithm Working Group

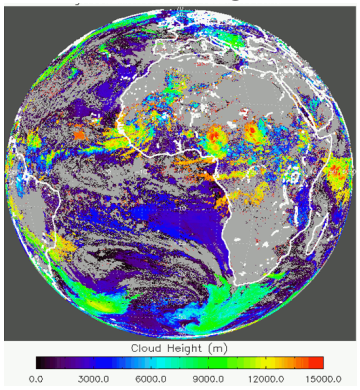
- **Mission:**
  - To select, develop, test, validate, and demonstrate Level-2+ algorithms that meet the GOES-R F&PS requirements and provide them to the GOES-R Ground Segment.
  - Provide sustained life cycle validation and Level-2 product enhancements

- **End-to-End Capabilities**
  - Instrument Trade Studies
  - Proxy Dataset Development
  - Algorithm Development and Testing
  - Product Demonstration Systems
  - Development of Cal/Val Tools
  - L2 Product Validation *(pre-launch)*
  - User Readiness and Education
  - Algorithm and application improvements
  - Integrated Cal/Val Enterprise System
  - Sustained Radiance & L2 Product Validation *(post-launch)*

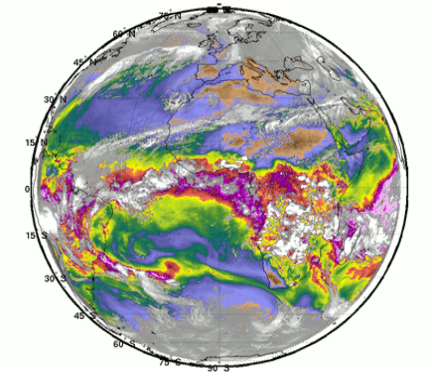


"Baseline" Product Examples

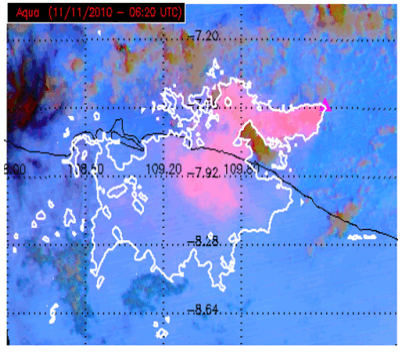
Cloud Height



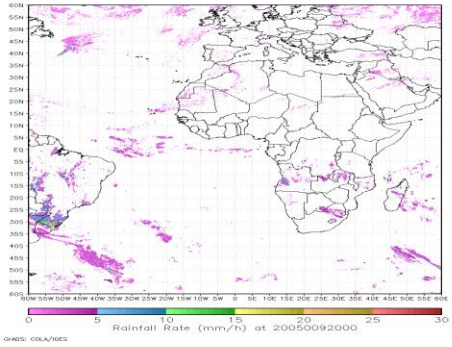
TPW



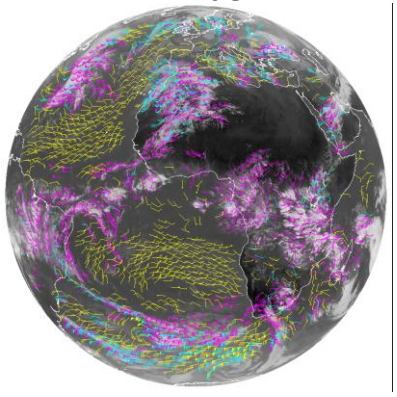
Volcanic Ash



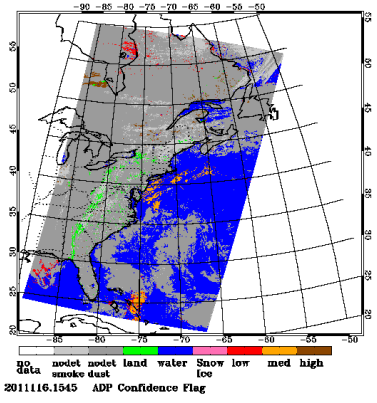
Rainfall Rate



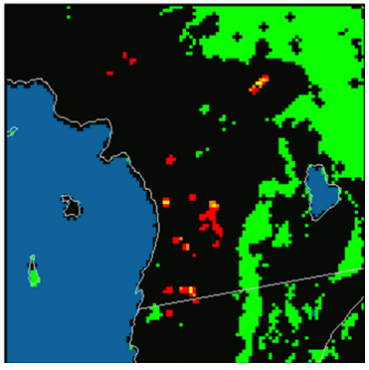
Winds



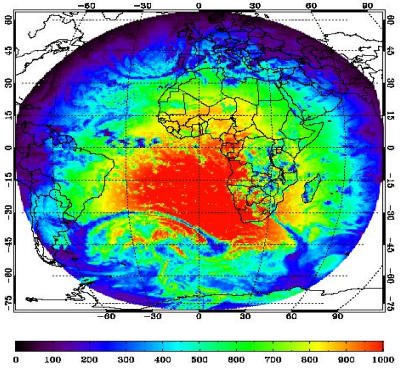
Aerosol Detection



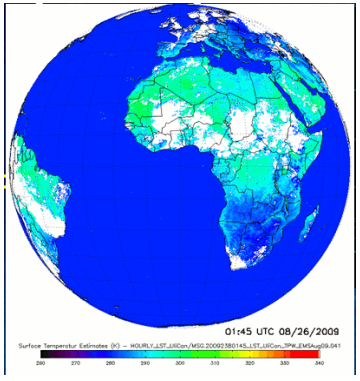
Fire Detection



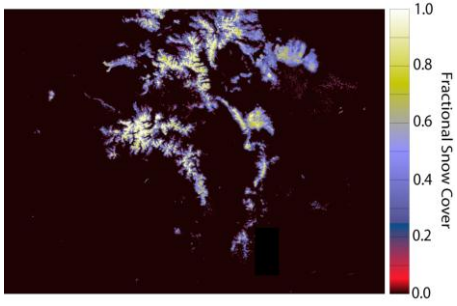
Shortwave Radiation (SFC)



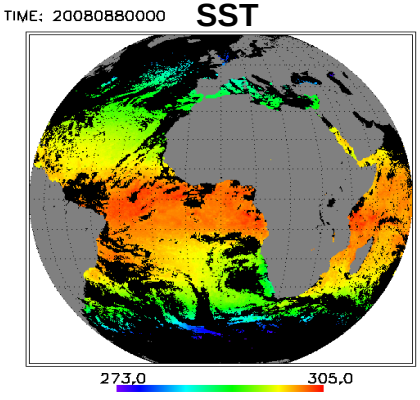
Land Surface Temperature



Snow Cover

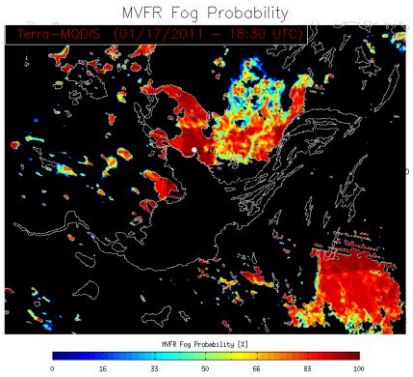


SST

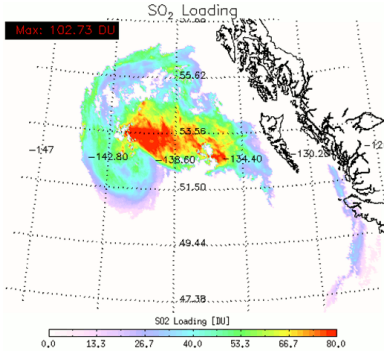


"Future Capabilities" Product Examples

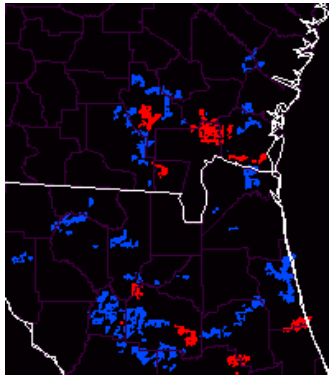
Low Cloud/Fog



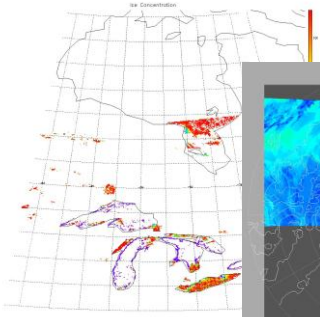
SO_2 Detection



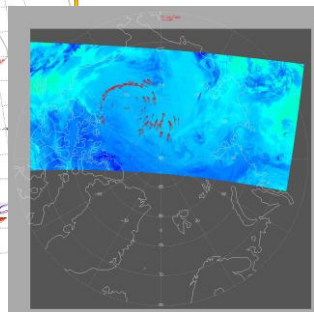
Convective Initiation



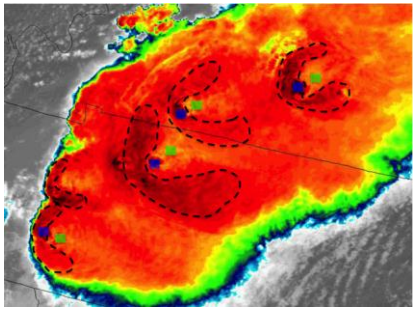
Ice Concentration



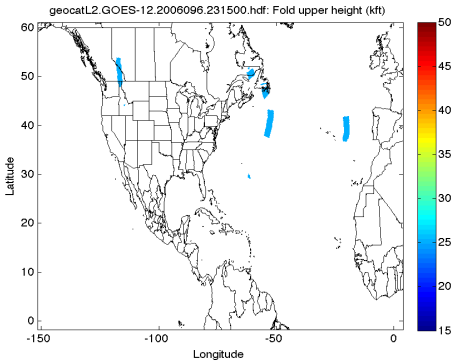
Ice Motion



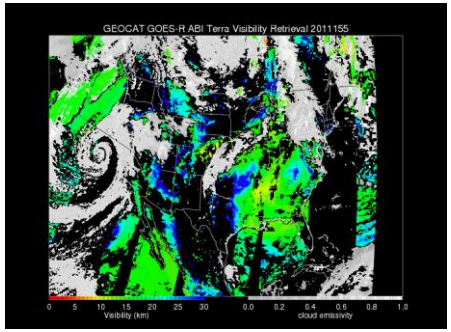
OvershootingTops/ Enhanced-V



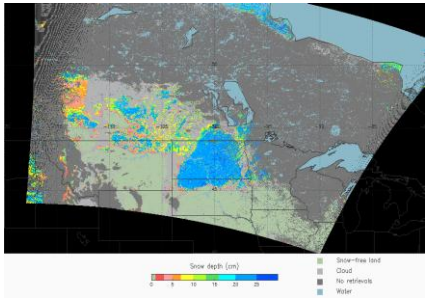
Turbulence



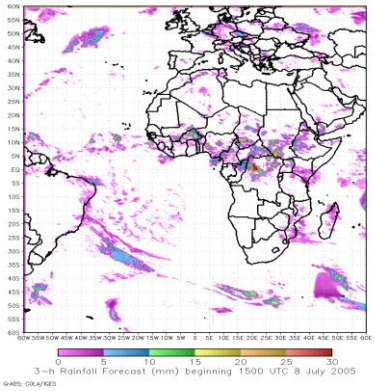
Visibility



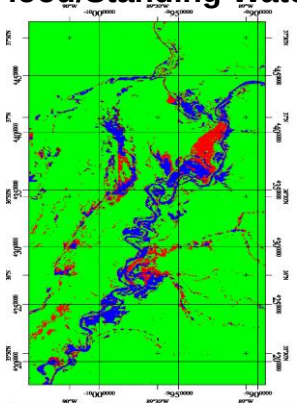
Snow Depth



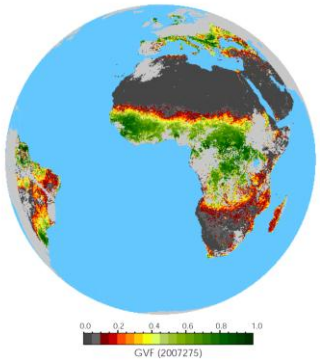
Rainfall Potential



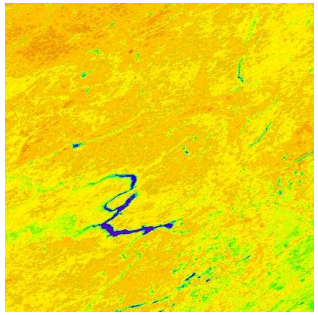
Flood/Standing Water



GVF



Surface Albedo



Ocean Currents